PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04Q 7/38 — A1

(11) International Publication Number: WO 98/31179

(43) International Publication Date: 16 July 1998 (16.07.98)

(21) International Application Number: PCT/FI98/00009

(22) International Filing Date: 2 January 1998 (02.01.98)

(30) Priority Data:
970119 10 January 1997 (10.01.97) FI

(71) Applicant *(for all designated States except US)*: NOKIA TELECOMMUNICATIONS OY [FI/FI]; Keilalahdentie 4, FIN–02150 Espoo (FI).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: PENTTINEN, Simo [FI/FI]; Radiomastontie 6 A 1, FIN–90230 Oulu (FI). LIINAMAA, Olli [FI/FI]; Kannuskuja 2 B 1, FIN–90540 Oulu (FI). LALLUKKA, Toivo [FI/FI]; Ketarakuja 3 D 24, FIN–90650 Oulu (FI). RAUTIAINEN, Jaakko [FI/FI]; Tapiontie 5 A 5, FIN–90570 Oulu (FI).

(74) Agent: PAPULA REIN LAHTELA OY; P.O. Box 981, Fredrikinkatu 61 A, FIN–00101 Helsinki (FI).

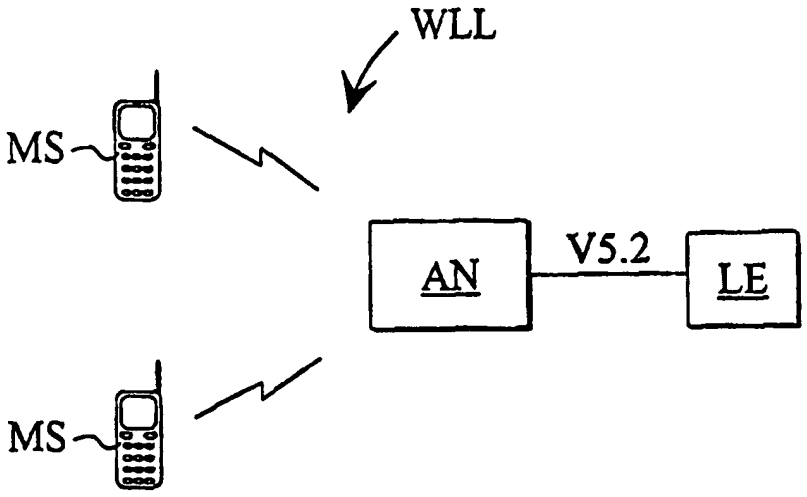
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: PROCEDURE AND SYSTEM FOR SETTING UP A CALL IN A WIRELESS LOCAL LOOP

(57) Abstract

The invention relates to a procedure for setting up a call in a wireless local loop (WLL) based on mobile communication technology, in which subscriber's stations (MS) are connected via a radio link to an access node (AN) and from the access node to a local exchange (LE) in a wired network. To achieve faster call setup, the message–based dialling information consistent with mobile communication specifications sent by a subscriber's station (MS) is converted in the access node (AN) into message–based dialling information consistent with the signalling used in the interface between the local exchange and the access node, and this information is transmitted to the local exchange.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

PROCEDURE AND SYSTEM FOR SETTING UP A CALL IN A WIRELESS LOCAL LOOP

The present invention relates to a procedure for setting up a call in a wireless local loop based on mobile communication technology, in which subscriber's stations are connected via a radio link to an access node and from the access node to a local exchange in a wired network.

In a wireless local loop (WLL), a subscriber's station is connected via a wireless link to an access node or a WLL controller. The access node may consist of multiplexers, crossbar switches and various transmitting systems. The WLL system may be based e.g. on technology used in mobile telephone systems, such as the GSM/DCS1800 technology (GSM, Global System for Mobile Communications; DCS, Digital Cellular System). GSM is a European digital mobile communication system standardized by ETSI. DCS-1800 is a mobile communication system standardized by ETSI, which is based on the GSM specification and aims at a more effective use of microcells and which works in the frequency range of 1800 MHz. Between the subscriber's station and the access node there is a base station, through which call signals sent by the subscriber's station over a radio channel are transmitted via the access node to a public telephone network and vice versa. The WLL controller can be connected to the telephone exchange using e.g. the V5.2 or V5.2 protocol.

Open interfaces (V5.1 and V5.2) between an access node and a telephone exchange are defined in the ETSI (European Telecommunications and Standards Institute) standards of the ETS 300 324 and ETS 300 347 series. V5 interfaces enable subscribers belonging to a physically separate access network, which may be either a wired or a wireless network, to be connected to a telephone exchange using a standard interface. A dynamic concentrator interface V5.2 consistent with the standards

ETS 300 347-1 and 347-2 consists of one or more (1 - 16) PCM (Pulse Code Modulation) cables. One PCM cable comprises 32 channels, each of which with a transfer rate of 64 kbit/s, i.e. 2048 kbit/s in all. The V5.2 interface supports analogue telephones as used in the public telephone network, digital, such as ISDN (Integrated Services Digital Network) basic and system subscriber connections as well as other analogue or digital terminal equipment based on semi-fixed connections.

In a prior-art method, when the dialling information is to be transmitted from an access node based on a mobile communication system to a local exchange in a wired network, the message-based dialling information consistent with mobile communication specifications has to be converted in the access node into a voice-frequency multifrequency code (MFT, multifrequency tone or DTMF, dual tone multifrequency) acceptable to the local exchange. The problem is that generating such signal tones is slow because the signal tones and the intervals between them should have a certain duration according to recommendations of the CCITT (CCITT, International Telegraph and Telephone Consultative Committee, working under ITU; ITU, International Telecommunication Union, working under the UN), which retards call setup.

The object of the invention is to eliminate the drawback mentioned above.

A specific object of the invention is to present a procedure that allows faster setup of a call from an access node to a local exchange in a wired network.

The procedure of the invention is characterized by what is presented in claim 1.

According to the invention, to achieve faster call setup, the message-based dialling information consistent with mobile communication specifications is converted in the access node into message-based dialling information consistent with the signalling used in the interface between the local exchange and the access no-

de, and this information is transmitted to the local exchange.

The invention has the advantage that it enables faster call setup from an access node to a local exchange in a wired network.

In an embodiment of the procedure, the subscriber's station is connected to the access node via a GSM/DCS interface, in which case the dialling information given by the subscriber's station is in accordance with the GSM specification. The signalling from the subscriber's station to the network is therefore implemented using signalling consistent with the GSM standard.

In an embodiment of the procedure, the subscriber's station is connected from the access node to the wired network local exchange via a V5 interface consistent with the ETS 300 347-1 standard, and the message-based dialling information consistent with mobile communication specifications is converted in the access node into message-based dialling information consistent with the ETS 300 324-1 specification.

In an embodiment of the procedure, the message-based dialling information consistent with the ETS 300 324-1 specification is transmitted in the form of so-called SIGNAL messages via the signalling channel of the V5 interface to the local exchange.

In the following, the invention is described in detail by the aid of a few examples of its embodiments by referring to the attached drawing, which is a diagram representing an example of a system applying the procedure of the invention.

The figure presents a wireless local loop WLL comprising a number of subscriber's stations MS, which communicate with an access node AN over a radio link. The signalling between the subscriber's station MS and the access node AN is message-based signalling consistent with the GSM specifications (GSM/DCS1800). The ac-

cess node AN again is connected to a local exchange LE in a wired network via a V5.2 interface consistent with the ETS 300 347-1 standard. When a call is made from the subscriber's station MS, the message-based dialling information consistent with the GSM specification is converted into message-based dialling information consistent with the ETS 300 324-1 standard, and this information is transmitted in the V5 interface as message-based signalling in the form of so-called SIGNAL messages via the signalling channel of the V5 interface to the wired network local exchange LE. The use of SIGNAL messages means that the PSTN protocol (one of the five network layer protocols of the V5.2 interface) is used. Therefore, WLL subscribers are interpreted in the local exchange as being normal analogue subscribers. If desirable, WLL subscribers can also be regarded in the local exchange LE as ISDN 2B+D subscribers. In this case, the message-based dialling information can be transmitted to the wired network local exchange LE via the signalling channel reserved for the subscriber in the V5 interface in the form of ISDN signalling messages (LAPD signalling).

The invention is not restricted to the examples of its embodiments described above, but instead many variations are possible within the framework of the inventive idea defined by the claims.

CLAIMS

1. Procedure for setting up a call in a wireless local loop (WLL) based on mobile communication technology, in which subscriber's stations (MS) are connected via a radio link to an access node (AN) and from the access node to a local exchange (LE) in a wired network, c h a r a c t e r i z e d in that, to achieve faster call setup, the message-based dialling information consistent with mobile communication specifications sent by a subscriber's station (MS) is converted in the access node (AN) into message-based dialling information consistent with the signalling used in the interface between the local exchange and the access node, and this information is transmitted to the local exchange.

2. Procedure as defined in claim 2, c h a r a c t e r i z e d in that the subscriber's station (MS) is connected to the access node (AN) via a GSM/DCS interface and the dialling information given by the subscriber's station is consistent with the GSM specification.

3. Procedure as defined in claim 1 or 2, c h a r a c t e r i z e d in that the subscriber's station (MS) is connected from the access node (AN) to the wired network local exchange (LE) via a V5 interface consistent with the ETS 300 347 standard, and that the message-based dialling information consistent with mobile communication specifications is converted in the access node (AN) into message-based dialling information consistent with the ETS 300 324-1 specification.

4. Procedure as defined in any one of claims 1 - 3, c h a r a c t e r i z e d in that the message-based dialling information consistent with the ETS 300 324-1 specification is transmitted via the signalling channel of the V5 interface to the local exchange (LE).

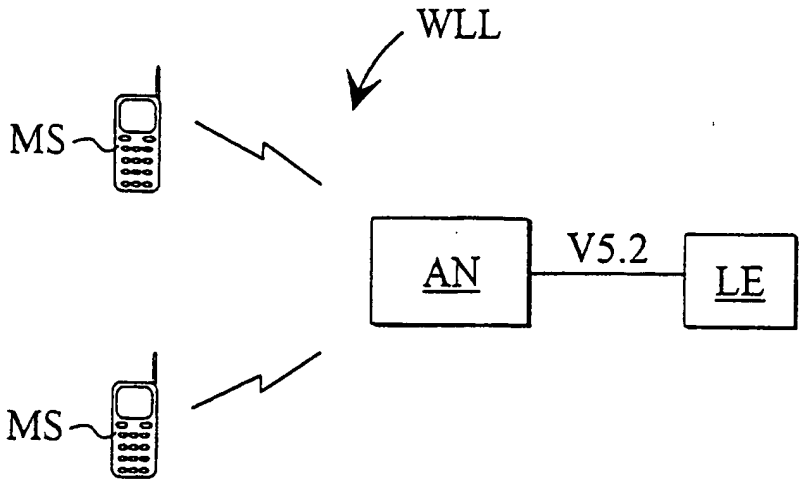


Fig.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 98/00009

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/38
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5040177 A (MAURICE MARTIN ET AL), 13 August 1991 (13.08.91), column 1, line 6 - line 9; column 1, line 40 - line 63; column 2, line 22 - line 33, column 3, line 18 - line 25 --	1-4
X	US 5157660 A (HIROSHI KUWAHARA ET AL), 20 October 1992 (20.10.92), column 4, line 65 - column 5, line 68; column 13, line 19 - line 60; column 20, line 9 - line 53, figure 1, abstract --	1-4

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 June 1998	30 -06- 1998
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Göran Petersson Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 98/00009

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 9716936 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 9 May 1997 (09.05.97), page 1, line 20 - page 2, line 18; page 3, line 10 - line 28; page 7, line 10 - page 17, line 16, abstract --	1-4
P,X	EP 0769883 A2 (LUCENT TECHNOLOGIES INC.), 9 October 1996 (09.10.96), column 3, line 19 - line 43; column 5, line 5 - line 30, see the figure --	1-4
X	US 5440613 A (JAMES J. FUENTES), 8 August 1995 (08.08.95), column 1, line 48 - column 2, line 53; column 5, line 23 - line 27; column 8, line 9 - line 16, abstract --	1
X	US 5542094 A (JUNICHI OWADA ET AL), 30 July 1996 (30.07.96), column 1, line 65 - column 2, line 33; column 2, line 62 - column 3, line 10 -- --------	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

09/06/98

International application No.
PCT/FI 98/00009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5040177 A	13/08/91	AT 120922 T	15/04/95
		AU 630983 B	12/11/92
		AU 5882190 A	17/01/91
		CA 2021251 A	18/01/91
		CN 1020838 B	19/05/93
		CN 1049579 A	27/02/91
		DE 69018331 D,T	03/08/95
		DK 410251 T	03/07/95
		EP 0410251 A,B	30/01/91
		SE 0410251 T3	
		ES 2071707 T	01/07/95
		FR 2649842 A,B	18/01/91
		JP 3064298 A	19/03/91
US 5157660 A	20/10/92	JP 3109848 A	09/05/91
WO 9716936 A1	09/05/97	AU 7511396 A	22/05/97
		SE 505660 C	29/09/97
		SE 9503828 A	01/05/97
EP 0769883 A2	09/10/96	CA 2188188 A	21/04/97
		GB 2306854 A,B	07/05/97
		GB 9521564 D	00/00/00
		JP 9233100 A	05/09/97
US 5440613 A	08/08/95	CA 2097351 A	12/02/94
		CN 1085708 A	20/04/94
		EP 0583137 A,B	16/02/94
		FI 933521 A	12/02/94
		JP 6217363 A	05/08/94
US 5542094 A	30/07/96	EP 0630166 A	21/12/94
		JP 2531346 B	04/09/96
		JP 7023443 A	24/01/95